Wood Energy 1999-2003, a new energy technology programme in Finland

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Targets of the programme

A new energy technology programme, Wood Energy, has been launched in Finland by the National Technology Agency (Tekes). In 1998, the energy use of forest chips amounted to 0.5 million m³ solid. The target of the Wood Energy Technology Programme is to increase the annual use of forest chips to 2.5 million m³ solid by 2003, i.e. five-fold in five years.

The target can be achieved mainly by increasing the use of logging residues from final cuttings, since salvaging residues from cut-over areas is much more cost competitive than harvesting smallwood from young sapling stands and early commercial thinnings. Nevertheless, chip production from young thinning stands will be developed as well.

Increasing the use of forest chips does require that the cost of production is reduced still further. The programme is also helping to develop quality control and storage of wood chips. Improvement of chip quality is not confined solely to forest chips, but it is just as important for wood residues from primary timber processing at mills. For this reason the scope of the programme also includes bark, sawdust, and other solid wood residues from the forest industry that are suitable for fuel.

Survey on the present use and price of forest chips

In 1999, forest chips were used by 135 heating plants (60 %) and 21 power plants (40 %). The total use of forest chips amounted to 750 000 m³ solid (5.9 PJ). Growth of the use is now mainly concentrated in large-scale combined heat and power plants that use fuel mixtures of several fuels: bark, other residues, peat, and coal. As the size of the plant grows, the proportion of forest chips decreases due to the limited availability.

The nominal price of forest chips has declined by 35% over the past two decades. In 1999, heating plants paid on average USD 2.5/GJ for the whole tree chips and USD 2/GJ for the chips from logging residues. The price level of saw dust and bark was USD 1.7/GJ. Attitudes towards the use of forest chips are favorable. A large number of new heating and power plants technically suitable for wood fuels are being designed and constructed. At the same time, cost pressures will arise due to to longer transport distances, less favorable logging sites and stumpage price expectations. To counterbalance this, the development of machinery and systems must be continued.

New methods and machinery for harvesting logging residues

Logging residues can be chipped either at stand, road-side, intermediate terminals, or at power plants. Tractors with special trailers can be used for hauling logging residues from forests to fuel terminals where residues are chipped and then transported to power plants. Enlargened load spaces and compaction equipment for trucks have been studied for both forest haulage and for hauling residues directly without chipping to power plants. Baling of residues, which increases the specific density of residues considerably, allows long hauling distances using standard trucks. Small users of chips can also use interchangeable containers which replace stockpiling of the chips at the plant.

Truck and tractor mounted drum chippers for logging residues, and also for whole-trees and residue bales, have been developed further to produce high quality fuel chips more efficiently.

Based on the study of cost factors of different harvesting systems the selection of the most suitable harvesting method is more accurate than before.

New machinery is being developed also for harvesting both energy and pulp wood in thinning stands with small-diameter trees. A felling device for based on multi-tree processing and load-compacting

devices for forest haulage and long-distance transportation of whole-trees have been constructed and tested. Until now, the economy

Projects on combustion
Combustion tests with whole tree and logging residue chips have been carried out both in bubbling and circulating fluidised bed combustion. Deposition of Ca, K, P, Mn and Cl, and slagging, fouling and corrosion risks, have been estimated by means of pilot reactor tests and full-scale test runs. In addition to forest chips, different fuel mixtures with bark, biosludge, deinking sludge and peat, were tested. The results indicate that the sulphur content of additional fuels can be absorbed by alkali metals of wood ashes. Chlorine can be released as hydrochloric acid that is not combined with alkali metals to form corroding chlorides.

Projects on environmental impacts of wood energy
The impact of different harvesting technologies on the abatement of green house gas emissions and the impact on carbon balances in the forest soil are studied in one of the projects. A comprehensive assessment of the environmental burdens and impacts of the wood energy production chain is carried out using Life Cycle Assessment (LCA) methodology. Also the information on how the different fuelwood harvesting alternatives will affect the nutrient status of the site, insect and fungal damages, success of regeneration work, as well as multiple use and biodiversity, will be compiled. New guidelines, commissioned by the Wood Energy Programme, suggest that one third of harvesting residues should be left at stand in final cuttings to provide the long term nutrient balance in soil if ash is not recycled.

Conclusion
The mission of the Wood Energy Programme is to remove barriers of the energy use of forest biomass with technological research, development and demonstration projects carried out in co-operation by research groups, forestry organizations, and industrial partners. The total number of projects was about 45 in the beginning of 2001. Research organizations were carrying out about 25 projects and industrial enterprises had 20 projects, many of which have research organizations as subcontractors. The programme's total budget for 1999-2003 is FIM 250 million (USD 40 million), Tekes' share of which amounts to FIM 50 million. The programme is coordinated by VTT Energy. The first results of the Programme have been presented, and topics of on-going projects are summarized.

References
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